

The Use of the Integrated Medical Model for Forecasting and Mitigating Medical Risks for a Near-Earth Asteroid Mission

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Introduction

The Integrated Medical Model (IMM) is a decision support tool that is useful to space flight mission managers and medical system designers in assessing risks and optimizing medical systems. The IMM employs an evidence-based, probabilistic risk assessment (PRA) approach within the operational constraints of space flight.

Methods

Stochastic computational methods are used to forecast probability distributions of medical events, crew health metrics, medical resource utilization, and probability estimates of medical evacuation and loss of crew life. The IMM can also optimize medical kits within the constraints of mass and volume for specified missions. The IMM was used to forecast medical evacuation and loss of crew life probabilities, as well as crew health metrics for a near-earth asteroid (NEA) mission. An optimized medical kit for this mission was proposed based on the IMM simulation.

Discussion

The IMM can provide information to the space program regarding medical risks, including crew medical impairment, medical evacuation and loss of crew life. This information is valuable to mission managers and the space medicine community in assessing risk and developing mitigation strategies. Exploration missions such as NEA missions will have significant mass and volume constraints applied to the medical system. Appropriate allocation of medical resources will be critical to mission success. The IMM capability of optimizing medical systems based on specific crew and mission profiles will be advantageous to medical system designers.

Conclusion

The IMM is a decision support tool that can provide estimates of the impact of medical events on human space flight missions, such as crew impairment, evacuation, and loss of crew life. It can be used to support the development of mitigation strategies and to propose optimized medical systems for specified space flight missions.

Learning Objectives

The audience will learn how an evidence-based decision support tool can be used to help assess risk, develop mitigation strategies, and optimize medical systems for exploration space flight missions.